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(54) PRODUCTION OF CRYSTALLINE SOLID SOLUTION POWDER, CRYSTALLINE SOLID SOLUTION POWDER OF INDIUM-TIN-OXIDE, ITO SPUTTERING TARGET AND ITO COATING FILM

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a powder having low electric resistivity below a specific value by allowing an indium-tin alloy to react with oxygen and subjecting the product to jet-cooling with a gas stream having a specific flow rate at an outlet and capable of cooling at a specific cooling rate in a specific temp. range to form a solid solution containing an equal to or above a specific quantity of an indium-tin-oxide solid solution phase in the crystal lattice of indium oxide.

SOLUTION: The jet-cooling is performed by the gas stream having 300-500 m/sec flow rate and capable of cooling the material at 105-108 K/sec cooling rate to 50-400°C. The temp. of the gas stream for performing the jet-cooling is 100-220 K. The indium-tin-oxide solid solution phase in the crystal lattice of indium oxide is controlled at least to 90 vol.%. The electric resistivity of the resultant crystalline solid solution is <100 Ωcm. The crystalline solid solution powder is used for indium-tin-oxide sputtering for forming a thin film having a particularly low electric resistivity or as a vacuum coating target.

## \* NOTICES \*

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## CLAIMS

## [Claim(s)]

[Claim 1] The entrance for a reagent. Gas supply system. Are the manufacture method of the crystalline-substance solid-solution powder equipped with the above, and oxygen is used as an indium-tin alloy and the 2nd reagent as the 1st reagent. The material to which crystalline-substance solid-solution powder has the electrical resistivity of under 100-ohmcm, and reacted within the plasma arc at that time and at the outlet of a plasma room Have the speed of 300m/s - 500 m/s, and injection cooling of this material is carried out by the gas stream cooled in temperature of 50 degrees C - 400 degrees C with the cooling rate of 105 K/s - 108 K/s within the limits. the inside of the crystal lattice of indium oxide -- an indium-tin-oxide crystalline-substance solid-solution phase -- it is characterized by manufacturing the crystalline-substance solid-solution powder which contains 90 capacity % even if few

[Claim 2] The manufacture method of crystalline-substance solid-solution powder according to claim 1 that the gas stream for cooling material has one or more Mach speed.

[Claim 3] The manufacture method of crystalline-substance solid-solution powder according to claim 1 of having the temperature within the limits whose gas streams for cooling material are 100K-220K.

[Claim 4] The manufacture method of the crystalline-substance solid-solution powder according to claim 1 which has a cooling rate within the limits of 106 K/s - 108 K/s.

[Claim 5] the inside of the crystal lattice of indium oxide -- an indium-tin-oxide crystalline-substance solid-solution phase -- the crystalline-substance solid-solution powder of the indium-tin-oxide characterized by having the electrical resistivity of 0.01-ohmcm - 95-ohmcm within the limits when 90 capacity % is contained even if few, and this indium-tin-oxide crystalline-substance solid-solution powder is compressed into 35 - 50% of the theoretical density

[Claim 6] Crystalline-substance solid-solution powder according to claim 5 which has the specific surface area based on the Brunauer-Emmett-teller (BET) method of a maximum of 3m<sup>2</sup>/g with the first [ an average of ] grain size within the limits of 0.03 micrometers - 0.2 micrometers.

[Claim 7] Crystalline-substance solid-solution powder according to claim 6 which has the electrical resistivity of 0.01-ohmcm - 20-ohmcm within the limits when indium-tin-oxide crystalline-substance solid-solution powder is compressed into 40% of the theoretical density.

[Claim 8] Crystalline-substance solid-solution powder according to claim 5 which has the concentration of the charge carrier of 5x10<sup>20</sup>cm<sup>-3</sup>-30x10<sup>20</sup>cm<sup>-3</sup> within the limits.

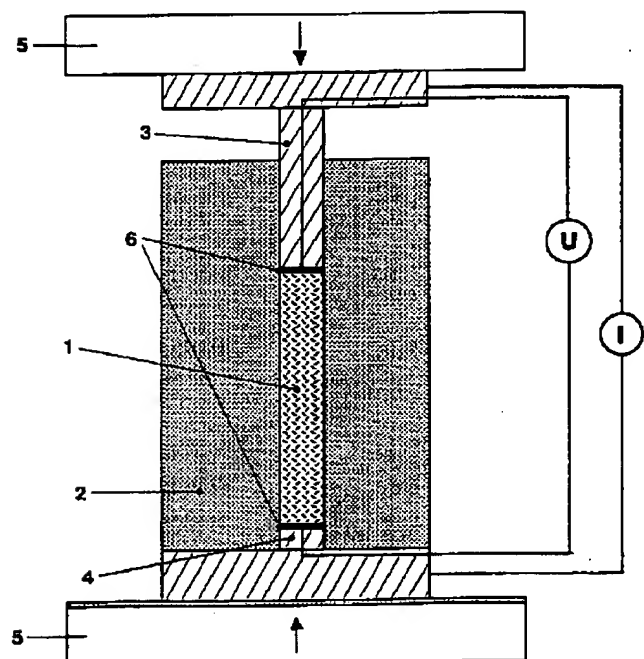
[Claim 9] Crystalline-substance solid-solution powder according to claim 8 which has the specific surface area based on the Brunauer-Emmett-teller (BET) method of a maximum of 3m<sup>2</sup>/g with the first [ an average of ] grain size within the limits of 0.03 micrometers - 0.2 micrometers.

[Claim 10] the inside of the crystal lattice of indium oxide manufactured based on the method according to claim 1 -- an indium-tin-oxide -- the crystalline-substance solid-solution powder of the indium-tin-oxide which contains 90 capacity % even if few

[Claim 11] The ITO sputtering target which consists of a sintered compact of crystalline-substance solid-solution powder according to claim 10.

[Claim 12] The ITO coat manufactured by sputtering according to claim 11 which carried out ITO target use.

[Claim 13] The ITO coat which is manufactured by sputtering according to claim 11 which carried out

Drawing selection drawing 1 

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